9/PRE Amdt. C
10-11-02

Attorney's Docket No. 39088/205438 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	Wen-Shi Huang, et al.	Confirmation No.:	4359
Appl. No.:	09/709,794	Group Art Unit:	2834
Filed:	November 10, 2000	Examiner:	Karl Tamai
For:	BEARING ASSEMBLY FOR A SHAFT HAVING REPULSIVE MAGNETIC BEARING RINGS		

October 3, 2002

Commissioner for Patents
Washington, DC 20231

PRELIMINARY AMENDMENT IN RCE

Sir:

This Preliminary Amendment is responsive to the Final Office Action of June 26, 2002 and the Request for Continued Examination (RCE) filed concurrently herewith. Please amend the above-identified application as follows:

In the Claims:

1. (Twice amended) A magnetic bearing assembly, comprising:

a magnetic portion connected to a shaft and a base for generating a radially repulsive magnetic force and an axially repulsive magnetic force, wherein said magnetic portion includes an upper magnetic portion and a lower magnetic portion which are symmetrically disposed in opposite orientations respectively; and

a bearing portion connected to said shaft and said base for supporting said shaft upon rotation of said shaft connected to said shaft,

wherein each of said upper magnetic portion and said lower magnetic portion includes a first magnetic ring and a second magnetic ring connected to said base, and a third magnetic ring connected to said shaft,

said first magnetic ring and said second magnetic ring are in substantially axial alignment so as to interact in repulsion to provide said axially repulsive magnetic force, and

said third magnetic ring is substantially aligned with said second magnetic ring so as to

C1 Cont'd.

provide said radially repulsive magnetic force, whereby said first magnetic ring and said third magnetic ring interact in repulsion to provide said repulsive magnetic force and keep the shaft axially positioned.

Please cancel Claims 4 and 5.

6. (Twice amended) The magnetic bearing assembly according to Claim 1, wherein said second magnetic ring and said third magnetic ring are disposed in radial alignment with each other to have like polar disposition.

C2

7. (Twice amended) The magnetic bearing assembly according to Claim 1, wherein said first magnetic ring and said second magnetic ring are disposed in axial alignment with each other to have opposite polar disposition.

16. (Twice amended) A magnetic bearing assembly, comprising:

C3

a lower magnetic portion connected to a shaft and a base for generating a repulsive magnetic force, wherein said lower magnetic portion has a first magnetic ring and a second magnetic ring connected to said shaft, a third magnetic ring connected to said base, and said first, second and third magnetic ring being juxtaposed along axial alignment to produce axially repulsive magnetic force; and

a bearing portion connected to said shaft and said base for supporting said shaft upon rotation of said shaft.

Please cancel Claims 20-25.

26. (New) The magnetic bearing assembly according to Claim 18, wherein said outer magnetic ring has an inner surface formed by a diameter of said outer magnetic ring and said inner magnetic ring has an outer surface formed by a diameter of said inner magnetic ring so that said outer surface of said inner magnetic ring is substantially aligned with said inner surface of said outer magnetic ring to provide radially repulsive magnetic force.

27. (New) The magnetic bearing assembly according to Claim 18, wherein said outer magnetic ring is connected to said base and said inner magnetic ring is connected to said shaft.

28. (New) The magnetic bearing assembly according to Claim 1, wherein said second magnetic ring has an inner surface formed by a diameter of said second magnetic ring and said third magnetic ring has an outer surface formed by a diameter of said third magnetic ring so that said outer surface of said third magnetic ring is substantially aligned with said inner surface of said second magnetic ring to provide radially repulsive magnetic force.

REMARKS

The present invention discloses a magnetic bearing assembly including a magnetic portion connected to a shaft and a base for generating repulsive magnetic forces that are both a radially repulsive magnetic force and an axially repulsive magnetic force, and a bearing portion connected to the shaft and the base for supporting the shaft upon rotation of the shaft. Claim 1 recites that the first magnetic ring and the second magnetic ring are connected to the base and are in substantially axial alignment so as to interact in repulsion to provide the axially repulsive magnetic force, and the third magnetic ring is connected to the shaft and is substantially aligned with the second magnetic ring so as to provide the radially repulsive magnetic force. Moreover, Claim 1 further defines that the first magnetic ring and the third magnetic ring interact in repulsion to provide the radially repulsive magnetic force because the first magnetic ring and the second magnetic ring are in substantially axial alignment.

New Claim 28 is added to define the configuration of the second magnetic ring and the third magnetic ring, in which the second magnetic ring has an inner surface formed by a diameter of the second magnetic ring, the third magnetic ring has an outer surface formed by a diameter of the third magnetic ring, and the outer surface of the third magnetic ring is substantially aligned with the inner surface of the second magnetic ring to provide radially repulsive magnetic force.

In addition, according to Fig. 4 of the present invention, Claim 16 recites the configuration of the first magnetic ring, the second magnetic ring and the third magnetic ring to distinctly define the axially aligned rings with opposite polar dispositions. Actually, according to page 5, lines 20-24, and Fig. 4 of the specification, it indicates that these three magnetic rings 75, 76, 77 are disposed in axial alignment to have opposite polar disposition for generating axially repulsive magnetic fields. Therefore, the rejection of Claims 16-20 under 35 U.S.C. 112 should be withdrawn.

After reviewing the patents to Yokono, Nair, Wampler, Kletschka, and Imlach, it is believed that the amended claims 1 and 16 are patentable over the cited references for the following reasons.

REJECTION UNDER 35 U.S.C. § 102

The Examiner rejected claims 1, 12, 13, 21, 22 and 25 under 35 U.S.C. 102(b) as being clearly anticipated by Yokono (JP Patent No. 62-095,952; hereinafter, Yokono).

Comparing the present invention with Yokono, the amended independent claims are not anticipated, taught or suggested by Yokono. Yokono relates to an axial and magnetic repulsive bearing 8 and a plastic ring 10 connected to shaft 5 and base 10 connected to shaft 5 and base 6. It is inherent that the plastic ring connected to the rotor and stator is a bearing. The bearings on each end act as upper and lower bearings respectively and each bearing is symmetrical with radially aligned bearings and axially aligned bearings. However, Yokono does not teach the configuration of the present invention. For example, Yokono does not disclose that the first magnetic ring and the second magnetic ring are in substantially axial alignment so as to interact in repulsion to provide the axially repulsive magnetic force, and the third magnetic ring is substantially aligned with the second magnetic ring so as to provide the radially repulsive magnetic force. In addition, Yokono does not disclose that the first magnetic ring and the third magnetic ring interact in repulsion to provide the repulsive magnetic force and keep the shaft axially positioned. From the above comparisons, it is apparent that the present application is not anticipated, taught or suggested by Yokono, and is patentable over Yokono.

REJECTION UNDER 35 U.S.C. § 103

The Examiner rejected claims 16-22 and 24 under 35 U.S.C. 103(a) as being clearly unpatentable over Wampler (US Patent No. 5,840,070; hereinafter, Wampler) and Kletschka (US Patent No. 5,195,877; hereinafter, Kletschka).

Comparing Claims 16-19, 26, 27 of the present invention with Wampler, the amended independent claim is not anticipated, taught or suggested by Wampler further in view of Kletschka. First of all, Wampler teaches axially aligned magnetic bearings (Fig. 8a) and lower bearings with the first ring magnet 31 mounted on an outer wall of casing 14, a second ring magnet 32 imbedded within a circular casing base 33, and a plurality of rod magnets 34 transversely extended from an upper face portion 36 to a lower face portion 37 of impeller 19.

(Col. 5, lines 63-65; Col. 6, lines 3-4) However, the present invention discloses that a first magnetic ring and a second magnetic ring connected to the shaft, a third magnetic ring connected to the base. Hence the configurations between Wampler and the present invention are really different. Furthermore, Wampler does not disclose that all magnets are rings. Also, Wampler must use three magnets 31, 32 and 34 to be arranged to effect respective repulsive forces in both the radial and axial direction. (Fig. 8a, Col. 6, lines 22-24) On the contrary, the present invention uses the inner and outer magnetic rings to provide the radially repulsive magnetic forces and the first, second and third magnetic ring to be juxtaposed along axial alignment to produce the axially repulsive magnetic force. Therefore, the configurations between Wampler and the present invention are different.

On the other hand, Kletschka teaches that repulsive ring magnets are used to provide axial and radial support to a rotor, but radial stabilization is achieved by the repulsive magnetic forces between magnets 90 and 94 and axial stabilization is achieved by repulsive magnetic forces between magnets 60 and 64. (Please refer to Fig. 7 and Col. 8, lines 19-23 of Kletschka.) The configuration of Kletschka is really different form that of the present invention.

From the above comparisons, it is apparent that the present application is not anticipated, taught or suggested by Wampler and Kletschka.

The Examiner rejected claims 4-7 and 23 under 35 U.S.C. 103(a) as being unpatentable over Yokono (J.P. Patent No. 62-095,952, Yokono) in view of Imlach (US Patent No. 5,894,181; hereinafter, Imlach).

Comparing Claims 1, 6,7, and 28 of the present invention with Yokono in view of Imlach, the amended claims are not anticipated, taught or suggested by Yokono further in view of Imlach. First of all, even though Yokono is somewhat similar to the present invention, Yokono does not disclose the configuration of magnetic rings to provide both radially repulsive magnetic force and axially repulsive magnetic force simultaneously. Actually, Yokono discloses that the shaft 5 and the magnetic bearings 8 interact in repulsion to provide the repulsive magnetic force. It is different from Claims 1, 6, 7, and 28 of the present invention. Furthermore, Yokono does not teach the third magnet ring being a ring.

On the other hand, even though Imlach teaches that three magnet rings can be used to support a shaft, it reveals that there is a repulsive portion of the magnetic field interaction that provides stability in one (or more) axis (axes) and an attractive portion of the magnetic field interaction that provides stability in the orthogonal axes (axis) in Imlach. (Col. 4, lines 9-13) However, the present invention discloses that the first magnetic ring and the second magnetic ring are in substantially axial alignment so as to interact in repulsion to provide the axially repulsive magnetic force, and the third magnetic ring is substantially aligned with the second magnetic ring so as to provide the radially repulsive magnetic force. Actually, the present invention does not mention any attractive portion of the magnetic field interaction that provides stability in the radial direction. Furthermore, Imlach discloses that the upper assembly 24 is rotatably mounted on a shaft 10 and also has two ring-shaped permanent magnets 244 and 246. Imlach also discloses that the lower assembly 22 has a ring-shaped permanent magnet 224. In this embodiment of Imlach the directly opposing magnets 224 and 244 provide an axial load capacity and a positive axial stiffness and the interaction between the stationary magnet 224 and the offset rotatable magnet 246 provides positive radial load capacity and stiffness. (Col. 3, lines 7-25) On the contrary, the present invention reveals that the first magnetic ring and the second magnetic ring is connected to the base, and the third magnetic ring is connected to said shaft. At the same time, in the present invention the third magnetic ring and the second magnetic ring interact to provide radially repulsive magnetic force, and the first magnetic ring and the third magnetic ring interact in repulsion to provide the repulsive magnetic force and keep the shaft axially positioned. Actually, Imlach does not disclose any configuration like the present invention. Therefore, it is impossible to combine Yokono and Imlach to achieve the configuration of the present invention.

From the above comparisons, it is apparent that the present application is not anticipated, taught or suggested by Yokono in view of Imlach.

Finally, it would never be obvious for one skilled in the art to modify Yokono in view of Wampler, Kletschka or Imlach to anticipate the present invention. In summary, the present invention is clearly distinguishable over the combination of Yokono with Imlach.

Favorable reconsideration by the Examiner and formal notification of the allowability of all claims as now presented are solicited.

Respectfully submitted,

Raymond O. Linker, Jr.
Registration No. 26,419

CUSTOMER NO. 00826
ALSTON & BIRD LLP
Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Charlotte Office (704) 444-1000
Fax Charlotte Office (704) 444-1111

CERTIFICATION OF FACSIMILE TRANSMISSION	CERTIFICATE OF MAILING
I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office at Fax No. on the date shown below. (Type or print name of person signing certification.) Signature Date	I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231, on October 3, 2002 Lorna Morehead